

#4

SEQUENCE LISTING

<110> BOURSAUX-EUDE, CAROLINE
GUISO-MACLOUF, NICOLE

<120> POLYPEPTIDES CONTAINING POLYMORPHISMS OF THE REPEATED
REGIONS OF PERTACTIN IN BORDETELLA PERTUSSIS,
BORDETELLA PARAPERTUSSIS, AND BORDETELLA
BRONCHISEPTICA, THEIR USE IN DIAGNOSTICS, AND IN
IMMUNOGENIC COMPOSITIONS

<130> 03495-0206-00000

<140> 09/855,754

<141> 2001-05-16

<150> 60/206,969

<151> 2000-05-25

<160> 24

<170> PatentIn Ver. 2.1

<210> 1

<211> 3000

<212> DNA

<213> Bordetella bronchiseptica

<400> 1

atcgatgatg	cgctcgctgta	acacggcaca	taccgtgcat	tgcagcgggt	ctggatggcg	60
ttcttcgtac	gtttgctgcg	ccattcttc	cctgttccat	cgcggtgceg	ccatggcggg	120
cgtctgctct	tcaccgga	tccaatgaac	atgtctctgt	cacgcattgt	cttggcgggc	180
ccccgccc	gcaccacact	ggccatggcg	ctggcgccgc	tggcgccgc	gcccgcggc	240
tacgcgcact	ggaacaacca	gtccatcatc	aaggccggcg	agcgccagca	cggcatccac	300
atcaagcaaa	gcgatggcg	cgcggtacgg	accgccaccg	gaacgaccat	caaggtaacg	360
ggctcgtaag	cccagggcg	cctgctggaa	aatcccgcgg	ccgagctgcg	gttcagaac	420
ggcagcgta	cgtcttcggg	acagctgttc	gacgaaggcg	tccggcgctt	tctgggcacc	480
gtcacgctca	aggccggcaa	gctggctgcc	gatcacgcca	cgctggccaa	cgtcagcgac	540
accggggagc	acgacggcat	cgcgctctat	gtggcgggcg	agcaggccca	ggccagcatc	600
gccgacagca	ccctgcaggc	cgcgggcgcg	gtgcgggtcg	agcgcgccgc	caatgtcacg	660
gtccaacgca	gcaccatcgt	tgacggggcg	ttgcataatc	gcaccctgca	gccgctgcag	720
ccggaagacc	ttccgcccag	ccgggtgggt	ctggcgccga	ccagcgtgac	cgccgtgccc	780
gccagcgggc	cgcccgcggc	ggtgtctgta	ttcggggcca	atgagcttac	ggttgatggc	840
gggcacatca	ccggggggcg	ggcagcgggg	gtggcgggca	tggacggggc	gatcgtgcat	900
ctgcagcgcg	cgacgatacg	gcgggggggac	gcgcctgccg	gcggtgcggg	tccaggcggt	960
gctgttcccg	gcggcttcgg	ccccctcctt	gacggctggt	atggcgtgga	tgtatcggat	1020
tccaccgtgg	acctcgctca	gtcgatcgtc	gaggcgccgc	agctgggcgc	cgcatccgg	1080
gcgggcccgc	gcgccagggt	gacgggtgtc	ggcggcagct	tgtccgcacc	gcacggcaat	1140
gtcatcgaga	ccggcgccgc	cgcgctgc	ttcccgctc	cggcctcgcc	cctgtcgatc	1200
accttgagg	cgggcgccag	ggcgagggg	agggcgctgc	tgtaccgggt	cctgcggag	1260
cccgtaagc	tgacgctggc	gggcggcgcc	caggggcagg	gcgacatcgt	cgcgacggag	1320
ctgcctccca	ttccaggcgc	gtcgagcggg	ccgctcgacg	tggcgctggc	cagccaggcc	1380
cgatggagcg	gcgctacccg	cgcggctgac	tcgctgtcca	tcgacaacgc	cacctgggtc	1440
atgacggaca	actcgaacgt	cggcgcgctg	cggctggcca	gcgacggcag	cgctgatttc	1500
cagcagccgg	ccgaagctgg	gcggttcaag	tgctgatgg	tcgatacgt	ggcgggttcg	1560
gggctgttcc	gcataaatgt	cttcggcgac	ctggggctga	gcgacaagct	ggtcgtcgat	1620
cgggacgcca	gcggccagca	caggctgttg	gtccgcaaca	gcggcagcga	gcccggccagc	1680
ggcaacacca	tgctgctggg	gcagacgcca	cgaggcagcg	cggcgacctt	tacccttgcc	1740

aacaaggacg	gcaagggtcga	tatcgggtacc	taccgctatc	gattggccgc	caacggcaat	1800
gggcagtgga	gcctgggtcgg	cgcgaaaggcg	ccgcccggcgc	ccaagcccgc	gccgcagccc	1860
gggtcccccagc	ccgggtcccca	gccgcccagc	ccgcccagc	cgccgcagcc	gccacagagg	1920
caagccggaag	cgccggcgcc	gcaaccggccg	gcgggcaggg	agttgtccgc	cgccgccaac	1980
gcggcggtca	acacgggtgg	ggtgggcctg	gccagcacgc	tctggtacgc	cgaaagcaat	2040
gcgtgtcca	agcgcttggg	cgagttgcgc	ctgaatccgg	acgcccggcg	cgcttggggc	2100
cgcggttcg	cgcaacgcca	gcaactggac	aaccgcgcg	ggcggcgctt	cgaccagaag	2160
gtggccgggct	tcgagctggg	cgccgaccac	gcggtggcgg	tggccggcgg	gcgctggcac	2220
ctgggcgggc	tggccgggcta	tacgcgcggc	gaccgcggct	ttaccggcga	cgccggcggc	2280
cacaccgaca	gcgtgcatgt	cgggggctat	gccacctata	tcgccaacag	cggtttctac	2340
ctggacgcga	cgctgcgcgc	cagccgcctc	gaaaatgact	tcaaggtggc	gggcagcgat	2400
gggtacgcgg	tcaagggcaa	gtaccgcacc	catggggtag	gcgcctcgct	cgaggcgggc	2460
cggcgcttcg	cccattgccga	cggtgtgttc	ctcgagccgc	aggccgagct	ggcggtgttc	2520
cgggtcggcg	gcgggttcgta	ccgcgcggcc	aatggcctgc	gggtgcgcga	cgaaggcggc	2580
agctcggtgc	tgggtgcctt	gggcctggag	gtcggcaagc	gcacgaact	ggcaggcggc	2640
aggcaggtgc	agcatacat	caaggccagc	gtgctgcagg	agttcgacgg	cgccgggtacg	2700
gtacgcacca	acggcatcgc	gcaccgcacc	gaactgcgcg	gcacgcgcgc	cgaactgggc	2760
ctgggcatgg	ccgcgcgcgt	gggcccggcg	cacagcctgt	atgcctcgta	cgagtactcc	2820
aagggcccca	agctgggcat	gccgtggacc	ttccacgcgg	gctaccggta	cagctggtaa	2880
agcgagaagg	gtccatcccc	ccgcggggga	gattttcctg	gaggttggcc	ggtgccagtc	2940
tccaggctca	ggcgggccagg	gcgtgcgggc	cgggcaggcc	gtgctggtgc	tggccgaacc	3000

<210> 2

<211> 2733

<212> DNA

<213> Bordetella pertussis

<400> 2

atgaacatgt	ctctgtcacg	cattgtcaag	gcggcgcccc	tgcgccgcac	cacgctggcc	60
atggcgctgg	gcgcgctggg	cgccgcccgg	gcggcgcatg	ccgactggaa	caaccagtcc	120
atcgtaaga	ccgggtgagcg	ccagcatggc	atccatatcc	agggctccga	cccgggcggc	180
gtacggaccg	ccagcggaac	caccatcaag	gtaagcggcc	gtcaggccca	gggcatcctg	240
ctagaaaatc	ccgcggccga	gctgcagttc	cggaacggca	gtgtcacgtc	gtcgggacag	300
ttgtccgacg	atggcatccg	gcgctttctg	ggcaccgtca	ccgtcaaggc	cggcaagctg	360
gtcgccgatc	acgccacgct	ggccaacggt	ggcgacacct	gggacgacga	cggcacgcgc	420
ctctatgtgg	ccggcggaaca	ggcccaggcc	agcatcgccg	acagcacctt	gcagggcgct	480
ggcgggcgtg	agatcgagcg	cggcgccaat	gtcacggtcc	aacgcagcgc	catcgtcgac	540
gggggtctgc	atatcggcgc	cctgcagtca	ttgcagcgcg	aagaccttcc	gcccagccgg	600
gtgggtgctg	gcgacacca	cgtgaccgcc	gtgcccgcga	gcggcgcgcc	cgccggcggtg	660
tctgtgttgg	gggcccagtga	gcttacgctc	gacggcgggc	acatcaccgg	cgggcgggga	720
gcgggggtgg	cggccatgca	aggggcggtc	gtgcatctgc	agcgcgcgac	gatacggcgc	780
ggggacgcgc	ctgcggcgcg	tgcggttccc	ggcggtgcgc	ttcccgggtg	tgcggttccc	840
ggcggttcg	gtcccggcgc	cttcggtccc	gtcctcgacg	gctggtatgg	cgtggacgta	900
tggggtccca	gcgtggagct	cgcccagtcg	atcgctcgagg	cgccggagct	gggcgcgcga	960
atccgggtgg	gcgcggcggc	cagggtgacg	gtgtcgggcg	gcagcttgtc	cgcaccgcac	1020
ggcaatgtca	tcgagaccgg	cggcgcgcgt	cgctttgcgc	ctcagccgcg	gcccctgtcg	1080
atcaccttgc	aggccggcgc	gcattgcccag	gggaaagcgc	tgctgtaccg	ggtcctgccc	1140
gagcccgctga	agctgacgct	gaccgggggc	gccgatgcgc	aggcgacat	cgtcgcgacg	1200
gagctgccct	ccattcccgg	cacgtcgatc	gggcccgtcg	acgtggcgct	ggccagccag	1260
gcccgatgga	cgggcgctac	ccgcgcggtc	gactcgctgt	ccatcgacaa	cgccacctgg	1320
gtcatgacgg	acaactcgaa	cgtcggtgcg	ctacggctgg	ccagcgacgg	cagcgtcgat	1380
ttccagcagc	cgcccggaagc	tgggcgggtt	aaggctcctga	cggtcaatac	gctggcgggg	1440
tgggggtgtg	tccgcatgaa	tgtcttcgcg	gacctggggc	tgagcgacaa	gctggtcgtc	1500
atgcaggacg	ccagcgggcca	gcacaggctg	tgggtccgca	acagcggcag	cgagccggcc	1560
agcgccaaca	ccctgctgct	ggtgcagacg	ccacgaggca	gcgcggcgac	ctttacctt	1620
gccaacaagg	acggcaagg	cgatatcggt	acctatcgct	atcgattggc	cgccaacggc	1680
aatgggcag	ggagcctggt	gggcgcgaag	gcgcgcgcgg	cgcccaagcc	cgcccgacg	1740

ccgggtcccc	agccgcccga	gccgcccag	ccgcagccgg	aagcgcggc	gccgcaaccg	1800
ccggcgggca	gggagttgtc	cgccgccgccc	aacgcggcgg	tcaacacggg	tgggggtggg	1860
ctggccagca	cgctctggta	cgccgaaagc	aatgcgttgt	ccaagcgcc	gggcgagttg	1920
cgccctgaatc	cggacgccc	cgccgcctgg	ggccgcggct	tcgcgcaacg	ccagcagctg	1980
gacaaccg	ccgggcccgg	cttcgaccag	aagggtggccg	gcttcgagct	gggcgcccga	2040
cacgcggtg	cggtggccc	cggacgctgg	cacctggg	ggctggccc	ctatacgcg	2100
ggcgaccg	gcttcaccg	cgacggcg	ggccacacc	acagcgtgca	tgtcggggg	2160
tatgccacat	atatcgccga	cagcggtttc	tacctggacg	cgacgctg	cgccagccg	2220
ctggagaatg	acttcaagg	ggcgggca	gacgggtacg	cggtcaagg	caagtaccg	2280
acccatggg	tgggcccctc	gctcgaggcg	ggccggcgct	ttacccatg	cgacggctg	2340
ttcctcgagc	cgcaggccga	gctggcggtg	ttccgggccc	gcggcggtg	gtaccgcg	2400
gccaacggcc	tgcgggtg	cgacgaagg	ggcagctcg	tgctgggtc	cctgggccc	2460
gaggtcggga	agcgcacg	actggcagg	ggcagcagg	tgacgcata	catcaagg	2520
agcgtgctg	aggagttcga	cgccgcgggt	acggtacaca	ccaacggcat	cgccgaccg	2580
accgaactg	gcggcacg	cgccgaactg	ggcctgggca	tggccgccc	gctgggccc	2640
ggccacagcc	tgtatgcctc	gtacgagtac	tccaagggg	cgaagctgg	catgccgtg	2700
accttccacg	cgggctaccg	gtacagctgg	taa			2733

<210> 3

<211> 3116

<212> DNA

<213> Bordetella parapertussis

<400> 3

atcgatgatg	cgctcgctgta	acacggcaaa	taccgtgcat	tgacgcgggt	ctggatggcg	60
ttcttcgtac	gtttgctg	ccattcttc	cctgttccat	cgcggtgcg	gcatggcg	120
cgtctgctct	tcacccggca	tccaatgaac	atgtctctgt	cacgcattgt	caaggcg	180
cccctgcgcc	gcaccacact	ggccatggcg	ctgggcgcgc	tgggcgcgc	gcccgcgcg	240
tacgccgact	ggaacaacca	gtccatcatc	aaggccggcg	agcgcagca	cggcatccac	300
atcaagcaaa	gcgatggcg	cgccgtacgg	accgccaccg	gaacgaccat	caaggtaagc	360
ggctgctcagg	cccagggcg	cctgctggaa	aatcccgcgg	ccgagctg	gttcagaac	420
ggcagcgtca	cgtcttcggg	acagctgttc	gacgaaggcg	tccggcgctt	tctgggcacc	480
gtcaccgtca	aggccggcaa	gctggctgcc	gatcacgcca	cgctggccaa	cgtcagcgac	540
accggggacg	acgacggcat	cgcgctctat	gtggccggcg	agcaggccca	ggccagcatc	600
gccgacagca	ccctgcagg	cgccggcg	gtgcgggtcg	agcgcggcg	caatgtcacg	660
gtccaacgca	gcaccatcgt	tgacggggg	ttgcatactg	gcaccctgca	gccgctgcag	720
ccggaagacc	ttccgcccag	ccgggtggtg	ctgggcgaca	ccagcgtgac	cgccgtgccc	780
gccagcggcg	cgccgcggcg	ggtgtttgta	ttcggggcca	atgagcttac	ggttgatggc	840
gggcacatca	ccggggggcg	ggcagcggg	gtggcgccca	tggacgggg	gatcgtgcat	900
ctgcagcgcg	cgacgatacg	ggggggggac	gcggtcgccg	gcgggtcggt	tccaggcggt	960
gcgggttccc	gcgggtgcgt	tcccggcg	ttcggccccc	tccttgacgg	ctggtatggc	1020
gtggatgtat	cggactccac	cgtggacctc	gctcagtcga	tcgtcgaggc	gccgcagctg	1080
ggcgccgcga	tccggggcg	ccgcggcgcc	agggtgacgg	tgtcggggcg	cagcttgtcc	1140
gcaccgcacg	gcaatgtcat	cgagaccggc	ggcgggtg	gtcgcttccc	gcctccggcc	1200
tcgccccctgt	cgatcacctt	gcaggcgggc	gcacggggcg	aggggagggc	gctgctgtac	1260
cgggtcctgc	cggagcccgt	gaagctgacg	ctggcgggcg	gcgcccagg	gcagggcgac	1320
atcgtcgcga	cggagctgcc	tcccattcca	ggcgcgtcga	gcgggcccgt	cgacgtggcg	1380
ctggccagcc	aggcccgatg	gacgggcgct	accgcgcgg	tcgactcgct	gtccatcgac	1440
aacgccacct	gggtcatgac	ggacaactcg	aacgtcgcg	cgctgcggct	ggccagcgac	1500
ggcagcgtcg	atttccagca	gccggccgaa	gctgggcgg	tcaaggctct	gatggctgat	1560
acgctggcg	gttcggggct	gttcgcgatg	aatgtcttcg	cggacctggg	gctgagcgac	1620
aagctggctg	tcatgcggga	cgccagcg	cagcacaggc	tgtgggtccg	caacagcg	1680
agcagcgcg	ccagcggcaa	caccatgctg	ctgggtgcaga	cgccacgagg	cagcgcg	1740
acctttaccc	ttgccaacaa	ggacggcaag	gtcgatatcg	gtacctaccg	ctategattg	1800
gccgccaacg	gcaatgggca	gtggagcctg	gtgggcgcga	aggcgccg	ggcgcccaag	1860
cccgcgcgc	agcccggctc	ccagcccgg	ccccagccg	cgcagccg	gcagccg	1920
cagccgcgc	agccgcgcga	gccgccacag	aggcagccg	aagcgccg	gccgcaaccg	1980

```

ccggcggggca gggagttgtc cgccgcccgc aacgcggcgg tcaacacggg tggggtgggc 2040
ctgcccagca cgctctggta cgccgaaagc aatgcgttgt ccaagcgctt gggcgagttg 2100
cgcctgaatc cggacgccgg cggcgcttgg ggccgcggct tcgcgcaacg ccagcaactg 2160
gacaacccgc ccgggcggcg cttcgaccag aaggtggccg gcttcgagct gggcgccgac 2220
cacgcggttg cggtagccgg cgggcgctgg cacctgggcg ggctggccgg ctatacgcg 2280
ggcgaccggg gctttaccgg cgacggcgcc ggccacaccg acagcgtgca tgtcgggggc 2340
tatgccacct atatacgcaa cagcggtttc tacctggacg cgacgctgcg cgccagccgc 2400
ctcgaaaatg acttcaaggt ggccggcagc gatgggtacg cggtaagggt caagtaccgc 2460
acccatgggg taggcgtctc gctcgaggcg ggccggcgct tcgcccattg cgacggctgg 2520
ttcctcgagc cgtaggccga gctggcgggt ttccgggtcg gcggcggtgc gtaccgcgcg 2580
gccaatggcc tgcgggtgcg cgacgaaggc ggagctcgcg tgctgggtcg cctgggcctg 2640
gaggtcgcca agcgaatcga actggcaggc ggagggcagg tgcagccata catcaaggcc 2700
agcgtgttgc aggagttcga cggcgcggtt acggtacgca ccaacggcat cgcgcacgcg 2760
accgaactgc gcggcagcgc cgccgaactg ggccctggga tggccgcccgc gctgggcccgc 2820
ggccacagcc tgtatgcctc gtacgagtac tccaagggcc cgaagctggc catgccgtgg 2880
accttccacg cgggctaccg gtacagctgg taaagcgaga agggctccat ccccgcgagg 2940
gagtttttcc tggaggttgg ccggtgccag tctccaggct caggcgccca gggcctgcgg 3000
gccgggcagg ccgtgctggt gctggccgaa ccattgcaca ggggtgttcg ccaagggcgg 3060
cgacttcgcc gatgaccagc aacgcccggg ggcgcacgct gcgcccgcgc gcgacgc 3116

```

<210> 4

<211> 911

<212> PRT

<213> Bordetella bronchiseptica

<400> 4

Met Asn Met Ser Leu Ser Arg Ile Val Leu Ala Ala Pro Leu Arg Arg
1 5 10 15

Thr Thr Leu Ala Met Ala Leu Gly Ala Leu Gly Ala Ala Pro Ala Ala
20 25 30

Tyr Ala Asp Trp Asn Asn Gln Ser Ile Ile Lys Ala Gly Glu Arg Gln
35 40 45

His Gly Ile His Ile Lys Gln Ser Asp Gly Ala Gly Val Arg Thr Ala
50 55 60

Thr Gly Thr Thr Ile Lys Val Ser Gly Arg Gln Ala Gln Gly Val Leu
65 70 75 80

Leu Glu Asn Pro Ala Ala Glu Leu Arg Phe Gln Asn Gly Ser Val Thr
85 90 95

Ser Ser Gly Gln Leu Phe Asp Glu Gly Val Arg Arg Phe Leu Gly Thr
100 105 110

Val Thr Val Lys Ala Gly Lys Leu Val Ala Asp His Ala Thr Leu Ala
115 120 125

Asn Val Ser Asp Thr Arg Asp Asp Asp Gly Ile Ala Leu Tyr Val Ala
130 135 140

Gly Glu Gln Ala Gln Ala Ser Ile Ala Asp Ser Thr Leu Gln Gly Ala
145 150 155 160

Gly Gly Val Arg Val Glu Arg Gly Ala Asn Val Thr Val Gln Arg Ser
 165 170 175
 Thr Ile Val Asp Gly Gly Leu His Ile Gly Thr Leu Gln Pro Leu Gln
 180 185 190
 Pro Glu Asp Leu Pro Pro Ser Arg Val Val Leu Gly Asp Thr Ser Val
 195 200 205
 Thr Ala Val Pro Ala Ser Gly Ala Pro Ala Ala Val Ser Val Phe Gly
 210 215 220
 Ala Asn Glu Leu Thr Val Asp Gly Gly His Ile Thr Gly Gly Arg Ala
 225 230 235 240
 Ala Gly Val Ala Ala Met Asp Gly Ala Ile Val His Leu Gln Arg Ala
 245 250 255
 Thr Ile Arg Arg Gly Asp Ala Pro Ala Gly Gly Ala Val Pro Gly Gly
 260 265 270
 Ala Val Pro Gly Gly Phe Gly Pro Leu Leu Asp Gly Trp Tyr Gly Val
 275 280 285
 Asp Val Ser Asp Ser Thr Val Asp Leu Ala Gln Ser Ile Val Glu Ala
 290 295 300
 Pro Gln Leu Gly Ala Ala Ile Arg Ala Gly Arg Gly Ala Arg Val Thr
 305 310 315 320
 Val Ser Gly Gly Ser Leu Ser Ala Pro His Gly Asn Val Ile Glu Thr
 325 330 335
 Gly Gly Gly Ala Arg Arg Phe Pro Pro Pro Ala Ser Pro Leu Ser Ile
 340 345 350
 Thr Leu Gln Ala Gly Ala Arg Ala Gln Gly Arg Ala Leu Leu Tyr Arg
 355 360 365
 Val Leu Pro Glu Pro Val Lys Leu Thr Leu Ala Gly Gly Ala Gln Gly
 370 375 380
 Gln Gly Asp Ile Val Ala Thr Glu Leu Pro Pro Ile Pro Gly Ala Ser
 385 390 395 400
 Ser Gly Pro Leu Asp Val Ala Leu Ala Ser Gln Ala Arg Trp Thr Gly
 405 410 415
 Ala Thr Arg Ala Val Asp Ser Leu Ser Ile Asp Asn Ala Thr Trp Val
 420 425 430
 Met Thr Asp Asn Ser Asn Val Gly Ala Leu Arg Leu Ala Ser Asp Gly
 435 440 445
 Ser Val Asp Phe Gln Gln Pro Ala Glu Ala Gly Arg Phe Lys Cys Leu
 450 455 460

Sub
C61

~~Met Val Asp Thr Leu Ala Gly Ser Gly Leu Phe Arg Met Asn Val Phe
465 470 475 480
Ala Asp Leu Gly Leu Ser Asp Lys Leu Val Val Met Arg Asp Ala Ser
485 490 495
Gly Gln His Arg Leu Leu Val Arg Asn Ser Gly Ser Glu Pro Ala Ser
500 505 510
Gly Asn Thr Met Leu Leu Val Gln Thr Pro Arg Gly Ser Ala Ala Thr
515 520 525
Phe Thr Leu Ala Asn Lys Asp Gly Lys Val Asp Ile Gly Thr Tyr Arg
530 535 540
Tyr Arg Leu Ala Ala Asn Gly Asn Gly Gln Trp Ser Leu Val Gly Ala
545 550 555 560
Lys Ala Pro Pro Ala Pro Lys Pro Ala Pro Gln Pro Gly Pro Gln Pro
565 570 575
Gly Pro Gln Pro Pro Gln Pro Pro Gln Pro Pro Gln Pro Pro Gln Arg
580 585 590
Gln Pro Glu Ala Pro Ala Pro Gln Pro Pro Ala Gly Arg Glu Leu Ser
595 600 605
Ala Ala Ala Asn Ala Ala Val Asn Thr Gly Gly Val Gly Leu Ala Ser
610 615 620
Thr Leu Trp Tyr Ala Glu Ser Asn Ala Leu Ser Lys Arg Leu Gly Glu
625 630 635 640
Leu Arg Leu Asn Pro Asp Ala Gly Gly Ala Trp Gly Arg Gly Phe Ala
645 650 655
Gln Arg Gln Gln Leu Asp Asn Arg Ala Gly Arg Arg Phe Asp Gln Lys
660 665 670
Val Ala Gly Phe Glu Leu Gly Ala Asp His Ala Val Ala Val Ala Gly
675 680 685
Gly Arg Trp His Leu Gly Gly Leu Ala Gly Tyr Thr Arg Gly Asp Arg
690 695 700
Gly Phe Thr Gly Asp Gly Gly Gly His Thr Asp Ser Val His Val Gly
705 710 715 720
Gly Tyr Ala Thr Tyr Ile Ala Asn Ser Gly Phe Tyr Leu Asp Ala Thr
725 730 735
Leu Arg Ala Ser Arg Leu Glu Asn Asp Phe Lys Val Ala Gly Ser Asp
740 745 750
Gly Tyr Ala Val Lys Gly Lys Tyr Arg Thr His Gly Val Gly Ala Ser
755 760 765~~

Sub
C1

Leu Glu Ala Gly Arg Arg Phe Ala His Ala Asp Gly Trp Phe Leu Glu
 770 775 780
 Pro Gln Ala Glu Leu Ala Val Phe Arg Val Gly Gly Gly Ser Tyr Arg
 785 790 795 800
 Ala Ala Asn Gly Leu Arg Val Arg Asp Glu Gly Gly Ser Ser Val Leu
 805 810 815
 Gly Arg Leu Gly Leu Glu Val Gly Lys Arg Ile Glu Leu Ala Gly Gly
 820 825 830
 Arg Gln Val Gln Pro Tyr Ile Lys Ala Ser Val Leu Gln Glu Phe Asp
 835 840 845
 Gly Ala Gly Thr Val Arg Thr Asn Gly Ile Ala His Arg Thr Glu Leu
 850 855 860
 Arg Gly Thr Arg Ala Glu Leu Gly Leu Gly Met Ala Ala Ala Leu Gly
 865 870 875 880
 Arg Gly His Ser Leu Tyr Ala Ser Tyr Glu Tyr Ser Lys Gly Pro Lys
 885 890 895
 Leu Ala Met Pro Trp Thr Phe His Ala Gly Tyr Arg Tyr Ser Trp
 900 905 910

<210> 5

<211> 910

<212> PRT

<213> Bordetella pertussis

<400> 5

Met Asn Met Ser Leu Ser Arg Ile Val Lys Ala Ala Pro Leu Arg Arg
 1 5 10 15
 Thr Thr Leu Ala Met Ala Leu Gly Ala Leu Gly Ala Ala Pro Ala Ala
 20 25 30
 His Ala Asp Trp Asn Asn Gln Ser Ile Val Lys Thr Gly Glu Arg Gln
 35 40 45
 His Gly Ile His Ile Gln Gly Ser Asp Pro Gly Gly Val Arg Thr Ala
 50 55 60
 Ser Gly Thr Thr Ile Lys Val Ser Gly Arg Gln Ala Gln Gly Ile Leu
 65 70 75 80
 Leu Glu Asn Pro Ala Ala Glu Leu Gln Phe Arg Asn Gly Ser Val Thr
 85 90 95
 Ser Ser Gly Gln Leu Ser Asp Asp Gly Ile Arg Arg Phe Leu Gly Thr
 100 105 110
 Val Thr Val Lys Ala Gly Lys Leu Val Ala Asp His Ala Thr Leu Ala
 115 120 125

Asn Val Gly Asp Thr Trp Asp Asp Asp Gly Ile Ala Leu Tyr Val Ala
 130 135 140
 Gly Glu Gln Ala Gln Ala Ser Ile Ala Asp Ser Thr Leu Gln Gly Ala
 145 150 155 160
 Gly Gly Val Gln Ile Glu Arg Gly Ala Asn Val Thr Val Gln Arg Ser
 165 170 175
 Ala Ile Val Asp Gly Gly Leu His Ile Gly Ala Leu Gln Ser Leu Gln
 180 185 190
 Pro Glu Asp Leu Pro Pro Ser Arg Val Val Leu Arg Asp Thr Asn Val
 195 200 205
 Thr Ala Val Pro Ala Ser Gly Ala Pro Ala Ala Val Ser Val Leu Gly
 210 215 220
 Ala Ser Glu Leu Thr Leu Asp Gly Gly His Ile Thr Gly Gly Arg Ala
 225 230 235 240
 Ala Gly Val Ala Ala Met Gln Gly Ala Val Val His Leu Gln Arg Ala
 245 250 255
 Thr Ile Arg Arg Gly Asp Ala Pro Ala Gly Gly Ala Val Pro Gly Gly
 260 265 270
 Ala Val Pro Gly Gly Ala Val Pro Gly Gly Phe Gly Pro Gly Gly Phe
 275 280 285
 Gly Pro Val Leu Asp Gly Trp Tyr Gly Val Asp Val Ser Asp Ser Ser
 290 295 300
 Val Glu Leu Ala Gln Ser Ile Val Glu Ala Pro Glu Leu Gly Ala Ala
 305 310 315 320
 Ile Arg Val Gly Arg Gly Ala Arg Val Thr Val Ser Gly Gly Ser Leu
 325 330 335
 Ser Ala Pro His Gly Asn Val Ile Glu Thr Gly Gly Ala Arg Arg Phe
 340 345 350
 Ala Pro Gln Ala Ala Pro Leu Ser Ile Thr Leu Gln Ala Gly Ala His
 355 360 365
 Ala Gln Gly Lys Ala Leu Leu Tyr Arg Val Leu Pro Glu Pro Val Lys
 370 375 380
 Leu Thr Leu Thr Gly Gly Ala Asp Ala Gln Gly Asp Ile Val Ala Thr
 385 390 395 400
 Glu Leu Pro Ser Ile Pro Gly Thr Ser Ile Gly Pro Leu Asp Val Ala
 405 410 415
 Leu Ala Ser Gln Ala Arg Trp Thr Gly Ala Thr Arg Ala Val Asp Ser
 420 425 430

Leu Ser Ile Asp Asn Ala Thr Trp Val Met Thr Asp Asn Ser Asn Val
 435 440 445
 Gly Ala Leu Arg Leu Ala Ser Asp Gly Ser Val Asp Phe Gln Gln Pro
 450 455 460
 Ala Glu Ala Gly Arg Phe Lys Val Leu Thr Val Asn Thr Leu Ala Gly
 465 470 475 480
 Ser Gly Leu Phe Arg Met Asn Val Phe Ala Asp Leu Gly Leu Ser Asp
 485 490 495
 Lys Leu Val Val Met Gln Asp Ala Ser Gly Gln His Arg Leu Trp Val
 500 505 510
 Arg Asn Ser Gly Ser Glu Pro Ala Ser Ala Asn Thr Leu Leu Leu Val
 515 520 525
 Gln Thr Pro Arg Gly Ser Ala Ala Thr Phe Thr Leu Ala Asn Lys Asp
 530 535 540
 Gly Lys Val Asp Ile Gly Thr Tyr Arg Tyr Arg Leu Ala Ala Asn Gly
 545 550 555 560
 Asn Gly Gln Trp Ser Leu Val Gly Ala Lys Ala Pro Pro Ala Pro Lys
 565 570 575
 Pro Ala Pro Gln Pro Gly Pro Gln Pro Pro Gln Pro Pro Gln Pro Gln
 580 585 590
 Pro Glu Ala Pro Ala Pro Gln Pro Pro Ala Gly Arg Glu Leu Ser Ala
 595 600 605
 Ala Ala Asn Ala Ala Val Asn Thr Gly Gly Val Gly Leu Ala Ser Thr
 610 615 620
 Leu Trp Tyr Ala Glu Ser Asn Ala Leu Ser Lys Arg Leu Gly Glu Leu
 625 630 635 640
 Arg Leu Asn Pro Asp Ala Gly Gly Ala Trp Gly Arg Gly Phe Ala Gln
 645 650 655
 Arg Gln Gln Leu Asp Asn Arg Ala Gly Arg Arg Phe Asp Gln Lys Val
 660 665 670
 Ala Gly Phe Glu Leu Gly Ala Asp His Ala Val Ala Val Ala Gly Gly
 675 680 685
 Arg Trp His Leu Gly Gly Leu Ala Gly Tyr Thr Arg Gly Asp Arg Gly
 690 695 700
 Phe Thr Gly Asp Gly Gly Gly His Thr Asp Ser Val His Val Gly Gly
 705 710 715 720
 Tyr Ala Thr Tyr Ile Ala Asp Ser Gly Phe Tyr Leu Asp Ala Thr Leu
 725 730 735

Arg Ala Ser Arg Leu Glu Asn Asp Phe Lys Val Ala Gly Ser Asp Gly
 740 745 750
 Tyr Ala Val Lys Gly Lys Tyr Arg Thr His Gly Val Gly Ala Ser Leu
 755 760 765
 Glu Ala Gly Arg Arg Phe Thr His Ala Asp Gly Trp Phe Leu Glu Pro
 770 775 780
 Gln Ala Glu Leu Ala Val Phe Arg Ala Gly Gly Gly Ala Tyr Arg Ala
 785 790 795 800
 Ala Asn Gly Leu Arg Val Arg Asp Glu Gly Gly Ser Ser Val Leu Gly
 805 810 815
 Arg Leu Gly Leu Glu Val Gly Lys Arg Ile Glu Leu Ala Gly Gly Arg
 820 825 830
 Gln Val Gln Pro Tyr Ile Lys Ala Ser Val Leu Gln Glu Phe Asp Gly
 835 840 845
 Ala Gly Thr Val His Thr Asn Gly Ile Ala His Arg Thr Glu Leu Arg
 850 855 860
 Gly Thr Arg Ala Glu Leu Gly Leu Gly Met Ala Ala Ala Leu Gly Arg
 865 870 875 880
 Gly His Ser Leu Tyr Ala Ser Tyr Glu Tyr Ser Lys Gly Pro Lys Leu
 885 890 895
 Ala Met Pro Trp Thr Phe His Ala Gly Tyr Arg Tyr Ser Trp
 900 905 910

<210> 6

<211> 922

<212> PRT

<213> Bordetella parapertussis

<400> 6

Met Asn Met Ser Leu Ser Arg Ile Val Lys Ala Ala Pro Leu Arg Arg
 1 5 10 15
 Thr Thr Leu Ala Met Ala Leu Gly Ala Leu Gly Ala Ala Pro Ala Ala
 20 25 30
 Tyr Ala Asp Trp Asn Asn Gln Ser Ile Ile Lys Ala Gly Glu Arg Gln
 35 40 45
 His Gly Ile His Ile Lys Gln Ser Asp Gly Ala Gly Val Arg Thr Ala
 50 55 60
 Thr Gly Thr Thr Ile Lys Val Ser Gly Arg Gln Ala Gln Gly Val Leu
 65 70 75 80
 Leu Glu Asn Pro Ala Ala Glu Leu Arg Phe Gln Asn Gly Ser Val Thr
 85 90 95

Ser Ser Gly Gln Leu Phe Asp Glu Gly Val Arg Arg Phe Leu Gly Thr
 100 105 110
 Val Thr Val Lys Ala Gly Lys Leu Val Ala Asp His Ala Thr Leu Ala
 115 120 125
 Asn Val Ser Asp Thr Arg Asp Asp Asp Gly Ile Ala Leu Tyr Val Ala
 130 135 140
 Gly Glu Gln Ala Gln Ala Ser Ile Ala Asp Ser Thr Leu Gln Gly Ala
 145 150 155 160
 Gly Gly Val Arg Val Glu Arg Gly Ala Asn Val Thr Val Gln Arg Ser
 165 170 175
 Thr Ile Val Asp Gly Gly Leu His Ile Gly Thr Leu Gln Pro Leu Gln
 180 185 190
 Pro Glu Asp Leu Pro Pro Ser Arg Val Val Leu Gly Asp Thr Ser Val
 195 200 205
 Thr Ala Val Pro Ala Ser Gly Ala Pro Ala Ala Val Phe Val Phe Gly
 210 215 220
 Ala Asn Glu Leu Thr Val Asp Gly Gly His Ile Thr Gly Gly Arg Ala
 225 230 235 240
 Ala Gly Val Ala Ala Met Asp Gly Ala Ile Val His Leu Gln Arg Ala
 245 250 255
 Thr Ile Arg Arg Gly Asp Ala Pro Ala Gly Gly Ala Val Pro Gly Gly
 260 265 270
 Ala Val Pro Gly Gly Ala Val Pro Gly Gly Phe Gly Pro Leu Leu Asp
 275 280 285
 Gly Trp Tyr Gly Val Asp Val Ser Asp Ser Thr Val Asp Leu Ala Gln
 290 295 300
 Ser Ile Val Glu Ala Pro Gln Leu Gly Ala Ala Ile Arg Ala Gly Arg
 305 310 315 320
 Gly Ala Arg Val Thr Val Ser Gly Gly Ser Leu Ser Ala Pro His Gly
 325 330 335
 Asn Val Ile Glu Thr Gly Gly Gly Ala Arg Arg Phe Pro Pro Pro Ala
 340 345 350
 Ser Pro Leu Ser Ile Thr Leu Gln Ala Gly Ala Arg Ala Gln Gly Arg
 355 360 365
 Ala Leu Leu Tyr Arg Val Leu Pro Glu Pro Val Lys Leu Thr Leu Ala
 370 375 380
 Gly Gly Ala Gln Gly Gln Gly Asp Ile Val Ala Thr Glu Leu Pro Pro
 385 390 395 400

Ile Pro Gly Ala Ser Ser Gly Pro Leu Asp Val Ala Leu Ala Ser Gln
 405 410 415
 Ala Arg Trp Thr Gly Ala Thr Arg Ala Val Asp Ser Leu Ser Ile Asp
 420 425 430
 Asn Ala Thr Trp Val Met Thr Asp Asn Ser Asn Val Gly Ala Leu Arg
 435 440 445
 Leu Ala Ser Asp Gly Ser Val Asp Phe Gln Gln Pro Ala Glu Ala Gly
 450 455 460
 Arg Phe Lys Val Leu Met Val Asp Thr Leu Ala Gly Ser Gly Leu Phe
 465 470 475 480
 Arg Met Asn Val Phe Ala Asp Leu Gly Leu Ser Asp Lys Leu Val Val
 485 490 495
 Met Arg Asp Ala Ser Gly Gln His Arg Leu Trp Val Arg Asn Ser Gly
 500 505 510
 Ser Glu Pro Ala Ser Gly Asn Thr Met Leu Leu Val Gln Thr Pro Arg
 515 520 525
 Gly Ser Ala Ala Thr Phe Thr Leu Ala Asn Lys Asp Gly Lys Val Asp
 530 535 540
 Ile Gly Thr Tyr Arg Tyr Arg Leu Ala Ala Asn Gly Asn Gly Gln Trp
 545 550 555 560
 Ser Leu Val Gly Ala Lys Ala Pro Pro Ala Pro Lys Pro Ala Pro Gln
 565 570 575
 Pro Gly Pro Gln Pro Gly Pro Gln Pro Pro Gln Pro Pro Gln Pro Pro
 580 585 590
 Gln Pro Pro Gln Pro Pro Gln Pro Pro Gln Arg Gln Pro Glu Ala Pro
 595 600 605
 Ala Pro Gln Pro Pro Ala Gly Arg Glu Leu Ser Ala Ala Ala Asn Ala
 610 615 620
 Ala Val Asn Thr Gly Gly Val Gly Leu Ala Ser Thr Leu Trp Tyr Ala
 625 630 635 640
 Glu Ser Asn Ala Leu Ser Lys Arg Leu Gly Glu Leu Arg Leu Asn Pro
 645 650 655
 Asp Ala Gly Gly Ala Trp Gly Arg Gly Phe Ala Gln Arg Gln Gln Leu
 660 665 670
 Asp Asn Arg Ala Gly Arg Arg Phe Asp Gln Lys Val Ala Gly Phe Glu
 675 680 685
 Leu Gly Ala Asp His Ala Val Ala Val Ala Gly Gly Arg Trp His Leu
 690 695 700

Gly Gly Leu Ala Gly Tyr Thr Arg Gly Asp Arg Gly Phe Thr Gly Asp
 705 710 715 720
 Gly Gly Gly His Thr Asp Ser Val His Val Gly Gly Tyr Ala Thr Tyr
 725 730 735
 Ile Ala Asn Ser Gly Phe Tyr Leu Asp Ala Thr Leu Arg Ala Ser Arg
 740 745 750
 Leu Glu Asn Asp Phe Lys Val Ala Gly Ser Asp Gly Tyr Ala Val Lys
 755 760 765
 Gly Lys Tyr Arg Thr His Gly Val Gly Val Ser Leu Glu Ala Gly Arg
 770 775 780
 Arg Phe Ala His Ala Asp Gly Trp Phe Leu Glu Pro Gln Ala Glu Leu
 785 790 795 800
 Ala Val Phe Arg Val Gly Gly Gly Ala Tyr Arg Ala Ala Asn Gly Leu
 805 810 815
 Arg Val Arg Asp Glu Gly Gly Ser Ser Val Leu Gly Arg Leu Gly Leu
 820 825 830
 Glu Val Gly Lys Arg Ile Glu Leu Ala Gly Gly Arg Gln Val Gln Pro
 835 840 845
 Tyr Ile Lys Ala Ser Val Leu Gln Glu Phe Asp Gly Ala Gly Thr Val
 850 855 860
 Arg Thr Asn Gly Ile Ala His Arg Thr Glu Leu Arg Gly Thr Arg Ala
 865 870 875 880
 Glu Leu Gly Leu Gly Met Ala Ala Ala Leu Gly Arg Gly His Ser Leu
 885 890 895
 Tyr Ala Ser Tyr Glu Tyr Ser Lys Gly Pro Lys Leu Ala Met Pro Trp
 900 905 910
 Thr Phe His Ala Gly Tyr Arg Tyr Ser Trp
 915 920

<210> 7

<211> 51

<212> PRT

<213> Bordetella bronchiseptica

<400> 7

Gln Arg Ala Thr Ile Arg Arg Gly Asp Ala Pro Ala Gly Gly Ala Val
 1 5 10 15
 Pro Gly Gly Ala Val Pro Gly Gly Ala Val Pro Gly Gly Phe Gly Pro
 20 25 30
 Leu Leu Asp Gly Trp Tyr Gly Val Asp Val Ser Asp Ser Thr Val Asp
 35 40 45

Leu Ala Gln
50

<210> 8
<211> 46
<212> PRT
<213> Bordetella bronchiseptica

<400> 8
Gln Arg Ala Thr Ile Arg Arg Gly Asp Ala Pro Ala Gly Gly Ala Val
1 5 10 15
Pro Gly Gly Ala Val Pro Gly Gly Phe Gly Pro Leu Leu Asp Gly Trp
20 25 30
Tyr Gly Val Asp Val Ser Asp Ser Thr Val Asp Leu Ala Gln
35 40 45

<210> 9
<211> 56
<212> PRT
<213> Bordetella bronchiseptica

<400> 9
Gln Arg Ala Thr Ile Arg Arg Gly Asp Ala Pro Ala Gly Gly Gly Val
1 5 10 15
Pro Gly Gly Ala Val Pro Gly Gly Phe Asp Pro Gly Gly Phe Gly Pro
20 25 30
Gly Gly Phe Gly Pro Val Leu Asp Gly Trp Tyr Gly Val Asp Val Ser
35 40 45
Gly Ser Thr Val Glu Leu Ala Gln
50 55

<210> 10
<211> 56
<212> PRT
<213> Bordetella bronchiseptica

<400> 10
Gln Arg Ala Thr Ile Arg Arg Gly Asp Ala Pro Ala Gly Gly Ala Val
1 5 10 15
Pro Gly Gly Ala Val Pro Gly Gly Ala Val Pro Gly Gly Phe Gly Pro
20 25 30
Gly Gly Phe Gly Pro Val Leu Asp Gly Trp Tyr Gly Val Asp Val Ser
35 40 45
Gly Ser Ser Val Glu Leu Ala Gln
50 55

<210> 11
 <211> 61
 <212> PRT
 <213> Bordetella bronchiseptica

<400> 11
 Gln Arg Ala Thr Ile Arg Arg Gly Asp Ala Pro Ala Gly Gly Ala Val
 1 5 10 15
 Pro Gly Gly Ala Val Pro Gly Gly Phe Gly Pro Gly Gly Phe Gly Pro
 20 25 30
 Gly Gly Phe Gly Pro Gly Gly Phe Gly Pro Val Leu Asp Gly Trp Tyr
 35 40 45
 Gly Val Asp Val Ser Gly Ser Ser Val Glu Leu Ala Gln
 50 55 60

<210> 12
 <211> 56
 <212> PRT
 <213> Bordetella bronchiseptica

<400> 12
 Gln Arg Ala Thr Ile Arg Arg Gly Asp Ala Pro Ala Gly Gly Ala Val
 1 5 10 15
 Pro Gly Gly Ala Val Pro Gly Gly Phe Gly Pro Gly Gly Phe Gly Pro
 20 25 30
 Gly Gly Phe Gly Pro Val Leu Asp Gly Trp Tyr Gly Val Asp Val Ser
 35 40 45
 Gly Ser Ser Val Glu Leu Ala Gln
 50 55

<210> 13
 <211> 51
 <212> PRT
 <213> Bordetella bronchiseptica

<400> 13
 Gln Arg Ala Thr Ile Arg Arg Gly Asp Ala Pro Ala Gly Gly Ala Val
 1 5 10 15
 Pro Gly Gly Ala Val Pro Gly Gly Phe Gly Pro Gly Gly Phe Gly Pro
 20 25 30
 Val Leu Asp Gly Trp Tyr Gly Val Asp Val Ser Gly Ser Ser Val Glu
 35 40 45
 Leu Ala Gln
 50

<210> 14
 <211> 49
 <212> PRT
 <213> Bordetella bronchiseptica

<400> 14
 Gly Ala Lys Ala Pro Pro Ala Pro Lys Pro Ala Pro Gln Pro Gly Pro
 1 5 10 15
 Gln Pro Gly Pro Gln Pro Pro Gln Pro Pro Gln Pro Pro Gln Arg Gln
 20 25 30
 Pro Glu Ala Pro Ala Pro Gln Pro Pro Ala Gly Arg Glu Leu Ser Ala
 35 40 45
 Ala

<210> 15
 <211> 52
 <212> PRT
 <213> Bordetella bronchiseptica

<400> 15
 Gly Ala Lys Ala Pro Pro Ala Pro Lys Pro Ala Pro Gln Pro Gly Pro
 1 5 10 15
 Gln Pro Gly Pro Gln Pro Pro Gln Pro Pro Gln Pro Pro Gln Pro Pro
 20 25 30
 Gln Arg Gln Pro Glu Ala Pro Ala Pro Gln Pro Pro Ala Gly Arg Glu
 35 40 45
 Leu Ser Ala Ala
 50

<210> 16
 <211> 59
 <212> PRT
 <213> Bordetella bronchiseptica

<400> 16
 Gly Ala Lys Ala Pro Pro Ala Pro Lys Pro Ala Pro Gln Pro Gly Pro
 1 5 10 15
 Gln Pro Gly Pro Gln Pro Gly Pro Gln Pro Gly Pro Gln Pro Pro Gln
 20 25 30
 Pro Pro Gln Pro Pro Gln Pro Pro Gln Arg Pro Glu Ala Pro Ala Pro
 35 40 45
 Gln Pro Pro Ala Gly Arg Glu Leu Ser Ala Ala
 50 55

<210> 17
 <211> 52
 <212> PRT
 <213> Bordetella bronchiseptica

<400> 17
 Gly Ala Lys Ala Pro Pro Ala Pro Lys Pro Ala Pro Gln Pro Gly Pro
 1 5 10 15
 Gln Pro Gly Pro Gln Pro Gly Pro Gln Pro Pro Gln Pro Pro Gln Pro
 20 25 30
 Pro Gln Arg Pro Glu Ala Pro Ala Pro Gln Pro Pro Ala Gly Arg Glu
 35 40 45
 Leu Ser Ala Ala
 50

<210> 18
 <211> 56
 <212> PRT
 <213> Bordetella bronchiseptica

<400> 18
 Gly Ala Lys Ala Pro Pro Ala Pro Lys Pro Ala Pro Gln Pro Gly Pro
 1 5 10 15
 Gln Pro Gly Pro Gln Pro Gly Pro Gln Pro Pro Gln Pro Pro Gln Pro
 20 25 30
 Pro Gln Pro Pro Gln Arg Gln Pro Glu Ala Pro Ala Pro Gln Pro Pro
 35 40 45
 Ala Gly Arg Glu Leu Ser Ala Ala
 50 55

<210> 19
 <211> 58
 <212> PRT
 <213> Bordetella bronchiseptica

<400> 19
 Gly Ala Lys Ala Pro Pro Ala Pro Lys Pro Ala Pro Gln Pro Gly Pro
 1 5 10 15
 Gln Pro Gly Pro Gln Pro Pro Gln Pro Pro Gln Pro Pro Gln Pro Pro
 20 25 30
 Gln Pro Pro Gln Pro Pro Gln Arg Gln Pro Glu Ala Pro Ala Pro Gln
 35 40 45
 Pro Pro Ala Gly Arg Glu Leu Ser Ala Ala
 50 55

<210> 20
 <211> 48
 <212> PRT
 <213> *Bordetella bronchiseptica*

<400> 20
 Gly Ala Lys Ala Pro Pro Ala Pro Lys Pro Ala Pro Gln Pro Gly Pro
 1 5 10 15
 Gln Pro Pro Gln Pro Pro Gln Pro Pro Gln Pro Pro Gln Arg Gln Pro
 20 25 30
 Glu Ala Pro Ala Pro Gln Pro Pro Ala Gly Arg Glu Leu Ser Ala Ala
 35 40 45

<210> 21
 <211> 52
 <212> PRT
 <213> *Bordetella bronchiseptica*

<400> 21
 Gly Ala Lys Val Pro Pro Ala Pro Lys Pro Ala Pro Gln Pro Gly Pro
 1 5 10 15
 Gln Pro Pro Gln Pro Pro Gln Pro Pro Gln Pro Pro Gln Pro Gln Pro
 20 25 30
 Gln Pro Gln Pro Glu Ala Pro Ala Pro Gln Pro Pro Ala Gly Arg Glu
 35 40 45
 Leu Ser Ala Ala
 50

<210> 22
 <211> 54
 <212> PRT
 <213> *Bordetella bronchiseptica*

<400> 22
 Gly Ala Lys Val Pro Pro Ala Pro Lys Pro Ala Pro Gln Pro Gly Pro
 1 5 10 15
 Gln Pro Pro Gln Pro Pro Gln Pro Pro Gln Pro Pro Gln Pro Gln Pro
 20 25 30
 Gln Pro Gln Pro Gln Pro Glu Ala Pro Ala Pro Gln Pro Pro Ala Gly
 35 40 45
 Arg Glu Leu Ser Ala Ala
 50

<210> 23
 <211> 42
 <212> PRT
 <213> *Bordetella bronchiseptica*

<400> 23

Gly Ala Lys Ala Pro Pro Ala Pro Lys Pro Ala Pro Gln Pro Gly Pro
 1 5 10 15

Gln Pro Pro Gln Pro Pro Gln Pro Gln Pro Glu Ala Pro Ala Pro Gln
 20 25 30

Pro Pro Ala Gly Arg Glu Leu Ser Ala Ala
 35 40

<210> 24

<211> 39

<212> PRT

<213> Bordetella bronchiseptica

<400> 24

Gly Ala Lys Ala Pro Pro Ala Pro Lys Pro Ala Pro Gln Pro Gly Pro
 1 5 10 15

Gln Pro Pro Gln Pro Gln Pro Glu Ala Pro Ala Pro Gln Pro Pro Ala
 20 25 30

Gly Arg Glu Leu Ser Ala Ala
 35